(No Model.)

I. D. BOYER.

REVOLVING FAN.

No. 491,006. Patented Jan. 31, 1893.

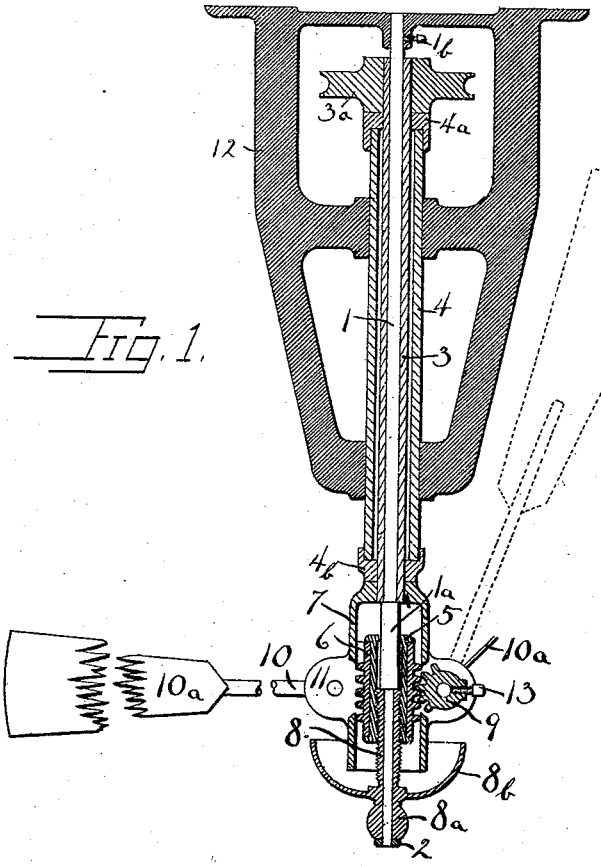

Fig. 1.

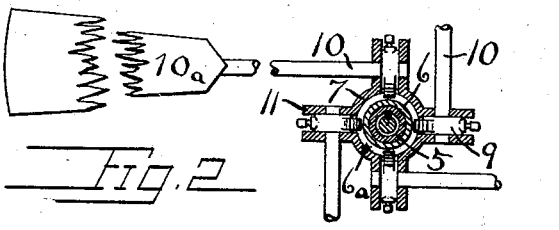

Fig. 2.

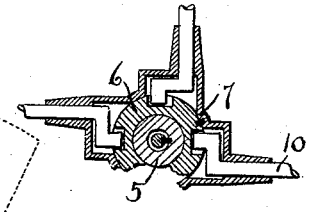

Fig. 6.

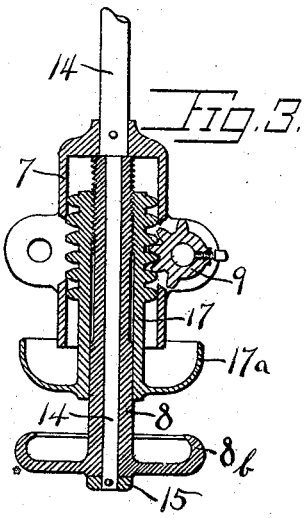

Fig. 3.

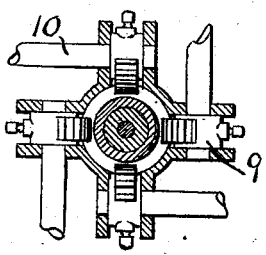

Fig. 4.

Fig. 5.

WITNESSES;

Walter Edmund Hoar

Claude T. Johnson.

INVENTOR,

Israel Donald Boyer.

UNITED STATES PATENT OFFICE.

ISRAEL DONALD BOYER, OF DAYTON, OHIO, ASSIGNOR TO HIMSELF AND WALTER EDMUND HAAS, OF SAME PLACE.

REVOLVING FAN.

SPECIFICATION forming part of Letters Patent No. 491,006, dated January 31, 1893.

Application filed December 2, 1891. Serial No. 413,832. (No model.)

To all whom it may concern:

Be it known that I, ISRAEL DONALD BOYER, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Revolving Fans, of which the following is a specification.

My invention relates to that class of fans which are usually employed in restaurants, offices, and similar places for producing a breeze in warm weather, and its object is to provide improved means for quickly adjusting the inclination of the vanes so as to regulate the amount of air thrown by the fan, and further, to provide a cheap and efficient means of attaching the blade shafts to the hub.

Referring to the drawings: Figure 1 is a side elevation in central section. Fig. 2 is a horizontal section in the plane of the axes of the blade shafts. Fig. 3 shows a modified construction in vertical section. Fig. 4 is a horizontal section of Fig. 3 in the plane of the axes of the blades. Fig. 5 is a view of a blade having its shaft bent at a right angle and with the pinion sector attached thereto. Fig. 6 is a horizontal section of another modified construction.

As shown in the drawings the fan is supposed to be suspended from the ceiling by means of the hanger, 12. The fan hub, 7 is rigidly attached to the lower end of the hollow shaft, 3, (Figs. 1 and 2,) to the upper end of which is secured the driving pulley, 3^a. This shaft passes through the fixed pipe, 4, and has its bearings in the caps 4^a and 4^b, which are attached to the two ends of the pipe. Through the center shaft 3, passes the rod 1, which is held stationary by means of the set screw 1^b in the hanger casting. This rod has an enlarged part 1^a, and its lower end is provided with a collar 2 which is secured to it by means of a pin driven through both collar and rod. Between this collar and the enlarged part 1^a, is the sleeve 8 which is free to be turned by hand upon rod 1 as an axis. The knob 8^a serves as a hand hold and the cup 8^b serves to catch any oil which may drip from the parts above. Upon the enlarged part 1^a there fits another sleeve 5 which is attached thereto by means of a feather which permits a longitudinal movement of the sleeve but prevents its rotation. Sleeve 5 has an internal thread engaging with an external thread of sleeve 8. It will thus be seen that sleeve 5, and sleeve 8 with its knob 8^a, always remain stationary except when the latter is grasped and turned by hand, the effect of which will be to screw sleeve 8 into or out of sleeve 5. As sleeve 8 is confined between the enlarged part 1^a and the collar 2, it is evident that the turning of it causes sleeve 5 to slide up or down on 1^a. Sleeve 5 is surrounded by another sleeve 6 which is feathered to the inside of the hub 7; and hence always revolves with the hub but is always free to slide up and down within the same. Sleeve 5 has two collars, one at its upper end and one at its lower end, and between these two collars the sleeve 6 is confined. One of the collars is an integral part of sleeve 5, while the other is screwed on or otherwise attached to it. Sleeve 6 is thus free to revolve about sleeve 5, but the collars on the latter compel both sleeves to rise and fall together.

As shown in the drawings the external sleeve has a series of rings around its outer periphery. These rings serve as gear teeth and mesh with the pinion sectors 9 on the blade shafts 10. The latter, four in number, in this instance, pass through holes in the ears 11 of the hub. The pinion sectors fit between these ears and when they are tightened to the blade shafts by means of their set screws 13, the blades cannot be removed. This forms a cheap and efficient method of attaching the blade to the hub. It is preferred to attach the blades to straight shafts in such manner that the center line of the blade coincides as nearly as may be with the axis of its shaft, as shown in Fig. 2. In this case the effect of raising or lowering the external sleeve, 6 will be to give a partial rotation to the pinion sector, 9; and hence to the blade shafts, 10 and blades, 10^a. But the blade shafts may be bent as shown in Fig. 5. In this case the effect of lowering or raising sleeve 6 will be to raise the blade into the position indicated by the dotted lines in Fig. 1, or to lower it from this position.

The operation is as follows: When the fan is in action the hub, 7 revolves carrying with

it the blades, 10ª and the sleeve 6. The sleeve 5 remains stationary, being feathered to the fixed rod 1. The sleeve 8 with its knob 8ª also remain stationary. When it is desired to alter the inclination of the blades the knob 8ª is grasped and turned by the hand, thereby raising or lowering the two sleeves, 5 and 6, the latter turning the pinion sectors. It is not necessary to have rings around the sleeve, 6 as the latter never turns in the hub. Neither is it necessary to have pinion sectors. A single finger or projection on the blade shaft, entering a socket in sleeve 6 would suffice, although I prefer the construction illustrated.

The fixed rod 1 is not a necessary part of my invention. Its function is simply to hold one of the sleeves stationary while the other is turned by hand. Instead of employing the rod 1 for this purpose the sleeve 5 might be extended downward and provided with a grasping handle so that it could be seized and held by one hand while the other hand turned sleeve 8. Such a construction is shown in Figs. 3 and 4, in which 14 represents the fan shaft which is solid and carries the hub 7 which is pinned to it. The collar 15 confines sleeve 8 to its place on shaft 14. For sake of simplicity I combine sleeves 5 and 6 in a single piece 17, the enlarged end of which, 17ª, serves the double purpose of a grasping handle and drip cup.

When the fan is in action the shaft, hub and sleeves all revolve together. If now the handle 17ª be grasped and held by the left hand the hub will continue to revolve, the teeth of pinion 9 running around in the grooves in 17. Sleeve 8 may then be turned with the right hand until the blades assume the desired angle when both handles are released and all parts again move as a unit.

It should further be remarked that in the construction illustrated in Figs. 1 and 2 it is not at all essential that sleeve 6 should be separate from sleeve 5 and feathered to the inside of the hub. The arrangement would work equally well if sleeves 5 and 6 were made in one solid piece feathered only to the enlarged part 1ª of the fixed rod 1. In this case the teeth of the pinion sectors 9 would run around in the grooves or rings in sleeve 5. If the blade shafts are straight and arranged as shown in Fig. 2, the air pressure will be equally distributed on each side of the axis of the blade which will thus be in equilibrium and will exert scarcely a perceptible pressure on the teeth of the pinion sectors 9, and consequently these teeth will run around in the grooves of sleeve 5 with scarcely any friction or wear. But if the blade shafts be bent as shown in Fig. 5, and by the dotted lines in Fig. 1, then the air pressure upward on the vanes acts with a powerful leverage on the teeth of sectors 9. In this case it is considered better not to let the teeth run around in the grooves as their small contact would cause them to cut and to rapidly wear away. Hence the exterior sleeve is divided into two parts 5 and 6 as explained in the early part of this specification. This gives a large and strong bearing surface and one which is easily kept lubricated. But in all cases where straight blades and blade shafts are used as shown in Fig. 2 it is preferred to make sleeves 5 and 6 a single piece, feathered only to the enlarged part 1ª of the fixed rod 1, because this construction is just as efficient and it is much cheaper to manufacture. When made thus it will be seen that it differs from the construction shown in Fig. 3 only by the addition of the fixed rod 1, to hold sleeve 17 from turning. The enlargement of the lower end of this sleeve into a combined drip cup and grasping handle is merely a change of configuration, not of function.

The usefulness of my invention is not confined to fans of the construction illustrated but may be adapted to various arrangements of blades.

In Fig. 6 I have illustrated one other modification. The parts 5, 6 and 7 are substantially the same as in Fig. 2 but the blade shafts 10 are bent at their inner ends so as to form small cranks, the ends of which enter sockets in the sleeve 6, the upward and downward motion of which rocks the cranks through a limited angle and hence adjusts the inclination of the vanes.

Having thus described my invention, what I claim is:

1. Within the hub of a revolving fan two concentric sleeves each free to rotate relatively to the other; the inner sleeve confined against longitudinal movement; the outer sleeve screwed upon the inner and having a limited helical movement thereon; means for rotating the sleeves relatively to each other; and connecting mechanism between the blade shafts and the outer sleeve whereby the longitudinal component of its motion changes the inclination of the blades substantially as specified.

2. In a revolving fan a hollow hub with the blade shafts mounted tangentially therein; pinion sectors on the blade shafts; within the hub a concentric sleeve having around its outer periphery a series of grooves which mesh with the teeth of the pinion sectors, and on its inner periphery a screw thread which engages a corresponding thread on the exterior periphery of an inner sleeve; the inner sleeve mounted freely on the lower end of the fan shaft but confined against longitudinal motion thereon; each sleeve provided with a grasping handle; the construction and arrangement being such that normally all parts revolve together as a unit, but the sleeves may be grasped by hand and turned relatively to each other while the fan continues to revolve, the longitudinal component of the relative motion turning the blade shafts substantially in the manner and for the purpose specified.

3. In a revolving fan a hub having a pair of parallel projecting ears for each blade shaft; a collar fitting freely between each pair of ears but confined by the ears against lateral motion; a blade shaft passing at right angles through each pair of ears and through the intermediate collar; a set screw in the collar; all in combination substantially in the manner and for the purpose specified.

ISRAEL DONALD BOYER.

Witnesses:
GEO. R. YOUNG,
WALTER S. ERHART.